



Credits: USGS

Sensors

Fiber-Optic Sensing and Characterization Portfolio

Technology portfolio including a distributed fiber-optic strain sensor system, distributed Rayleigh scatter sensor system, and related characterization technologies

NASA Langley Research Center has developed a portfolio of technologies for distributed fiber-optic strain sensing, distributed Rayleigh scatter sensing, and related characterization technologies. The primary application for these technologies is for down-hole sensing in the petrochemical industry. Other applications include structural, aerospace, and medical sensing. The characterization technologies, in addition to supporting the sensing technologies, have applications in the telecommunications market.

BENEFITS

- ➔ Highly mature with proven commercial viability
- ➔ Both DFOSS and DRFOSS offer new approaches to distributed strain sensing with much higher sensor counts than state-of-the-art systems
- ➔ Characterization technologies can be integrated into fiber optic devices or used in fiber optic test & measurement devices

APPLICATIONS

- ➔ Petrochemical sensing
- ➔ Structural sensing
- ➔ Aerospace sensing
- ➔ Telecommunication fiber-optic characterization
- ➔ Medical sensing

technology solution

NASA Technology Transfer Program

Bringing NASA Technology Down to Earth

THE TECHNOLOGY

This portfolio of technologies includes fiber-optic sensor and fiber-optic device characterization technologies. The sensors include the Distributed Fiber-Optic Strain Sensor (DFOSS) (US 5,798,521) technology and the supporting technology, Edge Triggered Apparatus for Measuring Strain in Bragg Gratings (US 6,566,648), which go together as a system. The DFOSS system allows precise strain sensing at hundreds of positions along a sensing fiber.

In addition, NASA has patented the Distributed Rayleigh Scatter Sensor (DRFOSS) technology (US 6,545,760), which also provides strain sensing at many points along a sensing fiber. DRFOSS determines strain from scattering within the fiber itself as opposed to DFOSS, which relies on low reflectance fiber Bragg gratings. Both DFOSS and DRFOSS offer new approaches to distributed strain sensing with much higher sensor counts than state-of-the-art systems. DRFOSS, however, offers an alternate approach to prior art for oil field down-hole sensing. These NASA fiber-optic technologies also have utility for distributed strain sensing in petrochemical, civil structure, and aerospace applications.

The characterization portion of this technology portfolio includes the High Precision Wavelength Monitor (US 6,426,496), which enables very precise triggering and laser tracking of the tunable lasers employed in the DFOSS and DRFOSS systems. NASA also has a patent for a Single Laser Sweep Full SParameter Characterization of Fiber Bragg Gratings (FBG) technology (US 6,376,830), which is a dispersion measurement technique that also provides the complete spectral response of a FBG. These two characterization technologies have applicability in support of the sensor applications as well as in systems that employ tunable lasers or Fiber Bragg Gratings (FBGs). Commercial uses for these technologies exist in fiber-optic test and measurement applications.



One application for DFOSS and DRFOSS is for aerospace sensing. Pictured is NASA's Pathfinder Solar-Powered Aircraft.

PUBLICATIONS

Patent No: 5,798,521; 6,566,648; 6,545,760; 6,376,830; 6,426,496

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